PERMIT MODULE III
SANITARY LANDFILL DESIGN

III.A. LINER DESIGN

Cells 1-11 of the landfill were constructed with the composite liner system described below (top to bottom):

- 18-inch granular leachate drainage layer with permeability greater than 5×10^{-2} cm/sec.;
- 16-ounce per square yard non-woven geotextile cushion layer;
- 60-mil High Density Polyethylene (HDPE) geomembrane;
- 2-foot compacted soil layer with permeability less than 1×10^{-7} cm/sec; and
- Prepared subgrade.

Starting with Cell 12, the landfill shall be underlain by the pre-approved alternate liner system described below (top to bottom):

- 18-inch granular leachate drainage layer with permeability greater than 5×10^{-2} cm/sec.;
- 60-mil High Density Polyethylene (HDPE) textured geomembrane;
- Geosynthetic clay liner (GCL) with a maximum hydraulic conductivity of 1×10^{-9} cm/sec.; and
- 12-inch controlled subgrade.

III.B. LINER CONSTRUCTION & CERTIFICATION

The landfill base liner for Phases 1 through 11 shall be constructed in accordance with the approved Design Plans, Technical Specifications, and Construction Quality Assurance Plan.

Prior to expansion into each new Cell, the permittee shall submit all required certification documents as indicated in Permit Module I Section I.D.1 – 3 as required by 9 VAC 20-81-490.A. Once this documentation has been submitted and approved by the Department, and a site inspection of the new Cell has been conducted, a Certificate to Operate (CTO) must be issued by the Regional Office prior to the facility accepting waste in the newly constructed Cell.

III.C. LANDFILL GAS MANAGEMENT SYSTEM

III.C.1. The facility shall implement and maintain a gas management plan in accordance with 9 VAC 20-81-200 to provide for the protection of public health, safety, and the environment during the periods of operation, closure, and post-closure care, in accordance with the following requirements:

III.C.1.a. The concentration of methane gas generated by the facility shall not exceed 25 percent of the lower explosive limit for methane (1.25% methane) in facility structures (excluding gas control or recovery system components); and

III.C.1.b. The concentration of methane gas shall not exceed the lower explosive limit for methane (5.0% methane) at the facility boundary.

III.C.2. The facility shall perform quarterly landfill gas monitoring of the perimeter gas monitoring network and facility structures in accordance with 9 VAC 20-81-200.B.4.

III.C.3. The facility shall make any necessary repairs to the gas monitoring network (including, but not limited to, dewatering if necessary because probes cannot be routinely monitored or making repairs to the concrete pad, cap, lock, or cover) and gas management and remediation systems prior to the next gas quarterly monitoring event unless an alternate repair timeframe is requested and approved.

III.C.4. Perimeter Gas Monitoring Network

III.C.4.a. The facility shall install and maintain perimeter gas monitoring probes at the locations specified in the Landfill Gas Management Plan on the Site Monitoring Plan, Figure 2A (Drawing 5) and Figure 2B (Drawing 6). The current perimeter gas monitoring network consists of a series of 19 landfill gas monitoring probes designated GP-101 through GP-107, GP-201 through GP-206, GP-301 through GP-303, GP-401, GP-402, GP-601, and GP-602. GP-105 is a voluntary boundary probe location.

III.C.4.b. If the perimeter gas monitoring network is expanded with the installation of new or replacement gas monitoring wells, the facility shall submit copies of the well boring logs and probe as-builts for inclusion in Appendix A of the Landfill Gas Management Plan within 30 days following construction completion.

III.C.4.c. All existing and future onsite structures shall be monitored in accordance with condition III.C.2 or have explosive gas monitoring equipment installed.

III.C.5. Landfill Gas Control Components

The existing and planned gas control system at the landfill consists of the following main elements:

III.C.5.a. A series of vertical gas extraction wells installed no more than 75% of the waste depth with a minimum of 10 feet of separation from the

bottom of the landfill, spaced at approximately 10-foot to 300-foot intervals.

III.C.5.b. A series of horizontal collectors installed to augment gas collection via the vertical extraction wells. Horizontal collector spacing ranges from 100 to 200 feet laterally, and approximately 30 to 60 feet vertically. In general, horizontal collectors are installed a minimum of 10 feet above the bottom liner, and 10 feet or more below final grade to prevent air infiltration.

III.C.5.c. A network of header and lateral piping installed to connect the vertical extraction wells and horizontal collectors, and to direct the collected gas to the Energy Recovery Facility (ERF) and the Utility Flare; and

III.C.5.d. A condensate control system consisting of self-draining condensate traps located at low points in the piping.

III.C.5.e. An Energy Recovery Facility, Utility Flare, and enclosed ground flare to manage the treated (compressed, cooled, and filtered) gas collected via the active gas collection system. These components are subject to the conditions of the facility's Title V Operating Permit.

III.C.6. Landfill Gas Monitoring Response and Remediation

III.C.6.a. Should the results of landfill gas monitoring indicate concentrations of methane in excess of the methane action level (4% methane or 80% of the lower explosive limit (LEL) at the facility boundary or 1.25% or 25% LEL in facility structures), the Operator shall:

i. Take all immediate steps necessary to protect public health and safety (safety precautions should include evacuation of occupied structures, if affected; notifying local fire/safety officials of potential landfill gas migration; and coordinating for off-site monitoring of structures located within 1,000 feet of the facility boundary);

ii. Investigate any active or passive gas control or remediation systems for proper connections and operation and make adjustments to vacuum, flow, or control valves, remove condensate, or make any other adjustments or repairs necessary to ensure proper operation, if applicable;

iii. Provide written notification within 5 working days of the methane action level exceedance indicating what has been done or is planned to be done to resolve the problem; and

iv. Increase the gas monitoring frequency per the requirements of III.C.6.c.

III.C.6.b. Should the results of landfill gas monitoring indicate concentrations of methane in excess of the methane compliance level (5% methane or 100% of the LEL at the facility boundary or 1.25% methane or 25% LEL in facility structures), the Operator shall:

i. Perform the response actions outlined under III.C.6.a.i. and a.ii.;

ii. Provide 24-hour oral notification of the methane compliance level exceedance;

iii. Provide written notification within 5 working days of the methane compliance level exceedance containing a description of the circumstances and its cause; the period of occurrence, including exact dates and times, and, if the circumstance has not been corrected, the anticipated time it is expected to continue. It shall also contain steps taken or planned to reduce, eliminate, and prevent reoccurrence of the circumstances resulting in an unusual condition or noncompliance;

iv. Increase the gas monitoring frequency per the requirements of III.C.6.c.

v. Implement the next phase of the approved remediation plan within 60 days or implement a revised remediation plan and submit the plan to DEQ for approval; and

vi. Assess the spacing of the entire perimeter monitoring network. If the spacing between any probes exceeds 250 foot spacing, the facility shall install additional perimeter probes unless the facility can show that such spacing is unwarranted based on site-specific factors.

III.C.6.c. The facility shall monitor a subset of the perimeter monitoring network consisting of the exceeding probe(s) and structure(s) and those probes/structures immediately adjacent, such that at least one (1) probe on either side of each exceeding probe/structure is being monitored at the increased frequency.

i. The increased monitoring frequency shall be weekly unless an alternate frequency is approved by the Department.

ii. Weekly monitoring shall continue until four (4) consecutive weekly readings yield methane concentrations below 80% LEL at the facility boundary or 25% LEL in facility structures. At that time, the facility shall implement monthly monitoring of the network subset until three (3) consecutive monthly readings yield methane concentrations below 80% LEL at the facility boundary

or 25% LEL in facility structures. At that time, the facility can return to quarterly monitoring.

iii. Once the required minimum number of consecutive monitoring events resulting in gas concentrations below action level are completed per III.C.6.c.ii. to justify returning to a lesser monitoring frequency, the facility shall submit monitoring data for ALL monitoring events since the implementation of the remedial action or remediation plan phase in order to assess progress towards return to compliance. If the return to a lesser monitoring frequency takes longer than six (6) months, monitoring data shall be submitted in tabular form with an accompanying graph to clearly document trends in data over time to justify the change in monitoring frequency.

III.D. LEACHATE MANAGEMENT

III.D.1. Leachate Storage

All leachate collected in the leachate collection system shall be stored in three-500,000 gallon storage tanks.

III.D.2. Leachate Disposal

Collected leachate can be disposed of off-site at the City of Hopewell WWTP, South Hill WWTP, and via Atlantic Waste Disposal, Inc. WWTP at SWP562. Leachate is pumped from the storage tanks into trucks for transportation.

Leachate will be analyzed and characterized in accordance with the Virginia Hazardous Waste Management Regulations (9VAC20-60) to determine if it is a characteristic hazardous waste.

Leachate may be recirculated at a rate of six to 10 gallons per ton of waste. A minimum of 30 feet of waste will be present above the liner system prior to commencing recirculation operations, and leachate will not be recirculated within 50 feet of the exterior slope of the landfill.